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SOIL TREATMENT FOR CONTROL OF BROWN ROT OF POTATOES

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Brown rot (*Bacterium solanacearum* E.F.S.) is a disease of potatoes, tomatoes, eggplant, peppers, tobacco, and at least 55 additional plants of the solanaceae and other families that grow in Florida.* The parasite survives from season to season in certain soils of Florida and has caused severe losses in the central, northern, and western sections of the state. In the Hastings section, annual losses of potatoes attributed to brown rot during the last nine years have varied from $25,000 to $117,000. It has been worst in those years when the temperatures have been above normal during the latter half of the potato growing season.

A specific soil treatment has been developed that will eradicate this disease from infested sandy soil; but the treatment is not recommended for muck, peat, marl, or clay soils, inasmuch as no control studies have been made on any of these types in the Hastings area. The treatment consists of an application of the proper amount of sulfur to the soil in May, June, or July to adjust the soil reaction to pH 4.0, which kills the brown rot bacteria. In October or November, six to eight weeks prior to planting a crop, the sulfured land is then treated with sufficient standard-mesh ground limestone to readjust it to a reaction favorable for potatoes.

To kill the brown rot bacteria, the upper six inches of the soil should be adjusted to pH 4.0 or lower. It was found that 50 pounds of sulfur per acre lowered the reaction of the sandy soils of the Hastings area approximately 0.1 on the pH scale, and the total quantity to use on each acre to control the disease varies with the initial reaction of the soil as is shown in Table 1.

Table 1—Approximate Quantities of Sulfur to Be Applied per Acre to Sandy Soils of Different Reactions to Adjust Them to pH 4.0 or Lower for Brown Rot Control

pH of Soil Sample	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4
Pounds of Commercial Flowers of Sulfur	300	400	500	600	700	800	900	1000	1100	1200	1300

The reaction (pH) may vary greatly in different portions of most fields, depending particularly upon the different soil types present, season of the year, and topography of the land. Consequently, samples should be taken from the upper 6 to 8 inches of the soil in representative areas of the field immediately before treating, and pH readings made so that the amount of sulfur required to adjust the reaction of all areas to pH 4.0 can be calculated. A diagram of the field should be made before soil samples are drawn, and the location of each sample and its pH reading together with the necessary quantity of sulfur noted on the diagram which will serve as a guide when the field is treated.

Commercial flowers of sulfur containing an inert material which prevents lumping is preferred, and the percentage of this material should be considered when calculating the quantity needed. Sulfur containing lime or any other alkaline material should not be used.

* Symptoms of this disease are described in Florida Press Bulletin 548.

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Tests have shown that calcium and dolomitic limestone produce approximately the same changes in the pH reactions. Since calcium limestone is cheaper than the dolomitic form, cost of treatment will be less if the former is used. A mixture of approximately three parts of calcic limestone to one part dolomite would be desirable because the dolomite would supply magnesium to replace that lost through leaching following the sulfur application. No attempt to economize on fertilizer should be made the year following the sulfur treatment because increased leaching resulting from the sulfur treatment has already lowered the natural fertility to some extent. At Hastings, maximum potato yields have been produced in sulfured soils readjusted to pH 5.2 by treatment with 3,000 pounds of ground limestone per acre. On the other hand, such crops as tomatoes, eggplant, and peppers do best in soils testing pH 5.5 to 6.0; consequently, more limestone must be used to adjust soil reactions for these crops than is needed for potatoes. Table 2 shows the approximate quantities of limestone to be applied to light, sandy soils of the Bladen, Scranton, and Leon types to change the reaction from pH 4.0 to higher pH values. If a soil is still too acid six to eight weeks after it is limed, another light application of limestone can be made and the process repeated until the desired pH is obtained.

Table 2—Approximate Quantities of Limestone to Be Applied per Acre to Change the Soil Reaction from pH 4.0 to Higher pH Values

pH Required	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4
Pounds of Calcium Limestone	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000

The land should be plowed and disked before it is treated with sulfur or limestone. Both materials should be distributed uniformly on the land either by broadcasting or with a lime distributor and thoroughly incorporated with the soil by several diskings.

A cover crop of cowpeas or crotalaria should be grown on sulfured land during the summer. These crops will do best if they are planted immediately after the soil is sulfured.

The cost of treatment will vary with the amount of sulfur and limestone used. At Hastings where soil reactions on most of the potato farms in the spring vary from pH 4.8 to 5.2, the cost of materials should not exceed $20 per acre. On farms where the treatment has been used to control brown rot of potatoes, the increase in net returns the first year, when the disease was severe in non-treated land, has been more than twice the cost of treatment. Furthermore, the disease has not increased in these soils during the five years since they were treated. The treatment has been used successfully on the Bladen, Scranton and Leon types of sandy soils. Similar types of sandy upland soils probably can be treated with like success.

In 1935, when the season was favorable for brown rot, tomatoes and eggplant were grown on severely infested land that had been treated the year before, and the yield of marketable fruit of tomatoes was 15 times greater and eggplant 10 times greater in the treated than in the non-treated plots. No further tests have been made to determine if the treatment would control brown rot of these two crops longer than one year, but it is probable that they will respond to the treatment like potatoes and can be grown safely in treated soils for at least five years.

Tests have shown that the Katahdin variety of potatoes is resistant to brown rot, and it is now grown on hundreds of acres of infested land in the Hastings section. However, the sulfur-limestone treatment for controlling the disease should be used in those fields where the loss from brown rot of tubers exceeds 5 percent in susceptible potato varieties such as the Spaulding Rose and Bliss Triumph. With the exception of potatoes, no resistant varieties of the other leading solanaceous crops, including tomatoes, eggplant, and peppers, have been found; consequently, to avoid losses from brown rot, these crops must be grown in naturally non-infested soil or in soil in which the parasite has been killed by the sulfur-limestone treatment.